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Energy taxation and competitiveness – Special provisions for business in Germany's environmental tax reform*

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Abstract

Environmental taxation very often comprises special provisions for parts of the business sector in order to attenuate effects on competitiveness of emission-intensive activities. This paper discusses motives, alternative designs and criteria for the evaluation of such safeguards and analyzes if such provisions can reconcile environmental and economic objectives. It looks at theoretical aspects as well as practical issues of implementation and evaluates special provisions that have been discussed or implemented in the framework of the environmental tax reform (ETR) introduced in Germany in 1999. This reform is characterized by two features: Firstly, it aims at the reduction of greenhouse gases and thus at a global environmental problem. Secondly, environmental taxes are embedded in the framework of a revenue-neutral tax reform, where the additional tax revenue is recycled to the tax payers by a reduction of social security contributions. The reform should finance „non-insurance-related benefits" of the pension insurance system in order to reduce labor costs and spur employment.

Keywords: environmental taxes, competitiveness, tax shift.

JEL codes: H23, Q28

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1 Environmental tax reform in Germany

In 1999 Germany introduced "eco-taxes" on fossil fuels and electricity (on top of existing energy taxes) aiming at a reduction of energy-related emissions. Eco-taxes are levied on final energy consumption. The tax rates have been gradually increased in five steps between 1999 and 2003. The increase is 3.07 Euro cents per liter gasoline and diesel fuel per year, adding up to 15.35 ct within five years. The increase of 2.05 ct per liter heating oil is executed in the first step only. The tax on natural gas was raised by 0.164 ct per kilowatt hour (kWh) in 1999 and another 0.202 ct at the beginning of 2003. Furthermore, a tax of 1.02 ct per kWh electricity was introduced in the first step and raised by 0.26 ct in the following four steps.[1] Coal will not be taxed.

In order to meet concerns about effects on the competitiveness of German industries, special provisions were made: Energy users of the goods and materials sector as well as agriculture, forestry and fishery pay a reduced tax rate. Moreover, some enterprises are eligible for tax rebates. These special provisions will be discussed in more detail below.

The additional revenue from these taxes will be recycled to the economy mainly by reducing social security contributions, more exactly contributions to the pension system. In fact, raising revenue for this purpose has been an important motive to introduce these taxes and gained substantial support for the ETR. Statutory social security contributions for health, pension and unemployment insurance are raised proportionally to the payroll and added up to 42.3 percent of gross wages before the reform. They were considered to be an important impediment to the creation of more employment in Germany. The government had announced in 1998 to reduce this sum by at least 2.4 percent below forty percent.[2] In 2003 the additional eco-taxes are expected to raise 18.8 billion euro.[3] This allows to reduce pension insurance rates by 1.7 percent compared to a situation without ETR.[4] However, since weak economic growth and high unemployment in Germany would have required an increase in contributions, the actual

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[1] On top of energy taxes, the value added tax (VAT) of 16 percent will be levied, so that the total price increase will be larger than indicated by these tax rates.

[2] Cf. "Aufbruch und Erneuerung – Deutschlands Weg ins 21. Jahrhundert — Koalitionsvereinbarung zwischen der Sozialdemokratischen Partei Deutschlands und Bündnis 90/Die GRÜNEN vom 20.10.1998, Bonn".

[3] Cf. BMU(2003).

[4] The reduction is split equally between employers and employees. It thus reduces the non-wage costs of employers; employees in turn receive higher net wages.

pension insurance rates were reduced by only 0.8 percent (from 21.3 percent in 1999 to 19.5 percent in 2003) with the help of government grants to the pension insurance.

2 Motives for special provisions

In principle environmental taxes in the tradition of Pigou (1920) or Baumol and Oates (1971) ought to be "uniform", i.e. levy the same tax on every unit of the tax base.[5] Therefore, a uniform tax on CO_2 or the carbon content of fossil fuels – and other GHGs in proportion to their warming potential – would be efficient from an economic point of view. In Germany, however, effective tax rates have been differentiated by energy carriers, uses or users of energy. The term special provisions will be used for all deviations from a uniform taxation which is intended to mitigate undesired economic effects.

The main argument for special provisions in the political debate seem to be that emissions-intensive energy-users should not be "burdened too much". Various reasons have been forwarded in support of this position. One addresses economic effects, another the environmental effectiveness of energy taxes.[6]

1. Environmental taxes may impair the competitiveness of energy-intensive enterprises and force them out of business – especially in open economies, in which enterprises face international competition. As a consequence, a part of the capital stock may be scrapped which otherwise would have been used for a longer time ("premature retirement of capital"). This concerns not only physical capital (machinery), but also human capital (professional training) and intangibles. Next to a loss of production capacity, this implies distributive effects that may appear unacceptable: Owners of energy-intensive companies, workers who lose their jobs or consumers of energy-intensive products may undergo economic losses. This may cause adjustment problems, especially in regions where energy-intensive sectors have a high share in economic production. There is a legal aspect to this argument, too. The

[5] A Pigou tax should be levied in proportion to the marginal damage caused by emissions. Due to information problems, it is usually necessary to revert to a second-best tax base, such as the immissions in a region or the emissions themselves. If it is not possible to derive the optimal amount of environmental protection through a cost-benefit analysis, taxes can still be used to efficiently achieve a politically set environmental standard (standards and prices approach, c.f. Baumol/Oates 1971).

[6] Several other reasons can justify deviations from a uniform tax in a neo-classical framework, such as imperfect competition or ancillary costs and benefits. These, however, did not play any role in the political debate in Germany.

principle of "protection of confidence" may restrict the government to change the economic conditions very fast. Enterprises have made investment decisions under the assumption that the economic environment determined by policy parameters will continue for a foreseeable future, and it may be unacceptable to expose them to drastic policy changes.

2. From an ecological point of view, a relocation of energy-intensive production would impair the effectiveness of climate change measures since the reduction of domestic emissions of greenhouse gases may be partially offset or even overcompensated by an increase of emissions abroad. This effect has been termed „carbon leakage". [7]

It is important to distinguish between these reasons, because they have different implications: If the concern about the economic effects is the dominating motivation, precautions should be taken to manage, not to eliminate, structural change. If a country aims at a permanent reduction of global emissions through unilateral measures (or even in a multilateral framework which does not include all the important emitters), it may want to take permanent precautions against carbon leakage. This, however, does not seem to be very relevant. It does not make sense to undertake unilateral measures in the long run if the environmental problem is global, as in the case of the greenhouse effect. Even in the short run, unilateral measures are probably more important from a political than an ecological point of view – i.e. to stimulate an international policy process in which industrialized countries have a special responsibility since they have caused most of the anthropogenic stock of GHGs in the atmosphere and still are the largest emitters in absolute numbers as well as per capita. Therefore, managing structural change seems to be the more relevant cause for special provisions.

3 Design of special provisions

Various tax concession concepts are conceivable. There are several important issues with regard to their design.[8] The most important issues in the German debate were the definition of enterprises or production processes that are eligible for tax reductions and what kind of tax reductions should be granted to the beneficiaries.

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[7] The theoretical as well as the empirical evidence about carbon leakage is mixed. There is, however, a broad consensus that carbon leakage is likely to mitigate the effectiveness of unilateral measures, but will not offset it fully. Cf. IPCC (1996).

[8] Cf. Bach, Kohlhaas, Seidel (1997).

The design of special provisions in the framework of the ecological tax reform in Germany has to take into account several conflicting objectives. They should reduce the economic pressure on energy-intensive activities, structural change and relocation without impairing the primary objectives of the tax reform – to reduce CO_2 emissions and raise revenue– more than necessary. Moreover, special provisions should not impair the basic quality of environmental taxes as a market-based instrument which gives an incentive to reduce emissions but leaves it to the market to find the best way to do so. Furthermore special provisions have to fulfill some legal and administrative requirements.

The definition of beneficiaries touches most of these objectives. The more precise the demarcation of the beneficiaries, the smaller will be the loss of incentive to reduce emissions and the loss of tax revenue. An accurate identification of those enterprises whose international competitiveness is threatened by higher energy taxes, however, requires detailed data -- for example, about the energy consumption of specific production processes, available technologies or the competitive situation on the relevant markets. The necessary administrative procedures would be very complicated, be subject to substantial uncertainties and require ample scope of discretion. Therefore, the process is likely to be subject to lobbying efforts in an attempt to safeguard rents and to prevent structural change. For this reason, discretionary special provisions should be kept to a minimum if the idea of environmental taxes as a market-oriented instrument is taken seriously. On the other hand, the less precisely special provisions need to be restricted to producers whose competitiveness is impaired by the taxes, the less complicated administrative procedures have to be, but tax revenue and emission reduction will be lower. Thus, there is a trade-off between the costs of identifying beneficiaries and the environmental effectiveness and revenue of the tax.

The next question to be addressed concerns the modification of the tax rates: What kind of reduction should be given to the beneficiaries? Not all of a firms energy use has to be subjected to the same tax rate and proposals have been made to tax the energy use below and above some threshold at different rate.

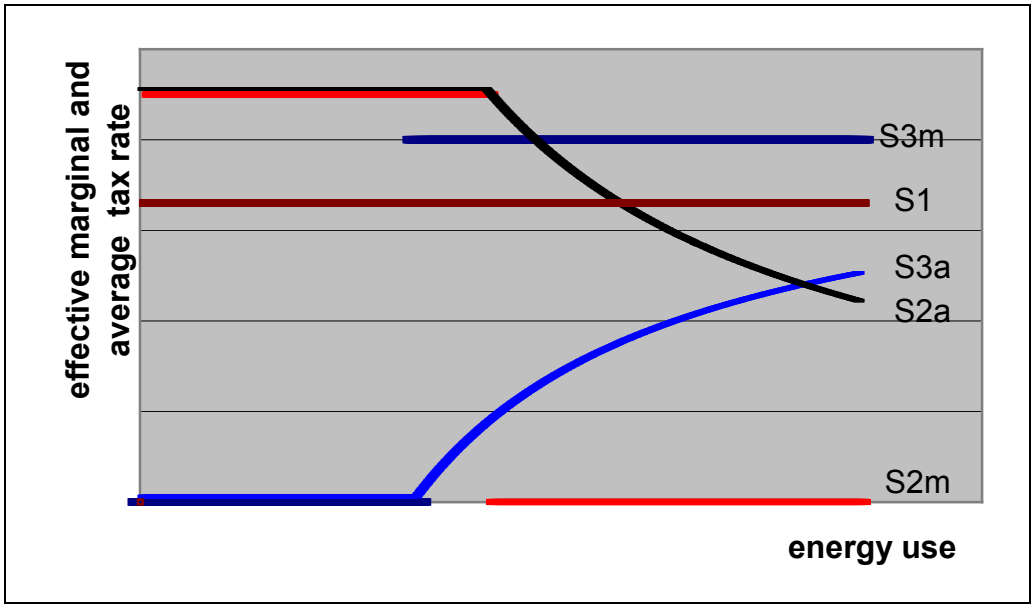
The crucial parameter for the economic effects of special provisions is their bearing on marginal and average costs of production and of energy input. The *marginal costs* of production and of the input factors are the criterion by which firms determine the level of production and their production technology. Firms equate the value of the marginal product of a production factor to its price and – under perfect competition – the marginal cost of

production to the price of the output. Thus, an increase of the marginal tax on energy gives an incentive to reduce the use of energy and the level of production.

The *average costs* are an important determinant of a firm's profits and thus for distributive effects on the one hand and investment decisions on the other. If the government wants to give an incentive to make new investments in Germany by way of special provisions, it should reduce the average burden of the energy tax.

Figure 1 shows three stylized tax patterns. The first (schedule S1) shows a tax with an identical tax rate for every unit of energy use. It corresponds to a Pigou tax or a standard-price approach if the marginal damage is identical for every unit of emissions. In this case, the average rate equals the marginal rate. The second (schedules S2a and S2m) depicts the case where a higher (marginal) tax rate is applied for energy uses below a certain (firm-specific) threshold. The average tax rate is identical to the marginal rate at the beginning and declining but higher than the marginal rate for energy-intensive production. S 3 represents the case of a tax-free allowance, where a certain "basic consumption" is tax free, whereas the full rate is applied to energy use above a threshold. Energy-intensive production will pay the full marginal tax rate, whereas the average rate may be substantially lower.

Figure 1: Stylized tax schedules



These schedules illustrate the idea that applying differentiated tax rates allows to pursue to different degrees the competing targets of static allocation incentive (high marginal tax rate), investment incentive (low average rate) and revenue raising (high average rate). If the highest possible incentive to reduce emissions is to be achieved with as little tax burden for the

enterprises as possible, tax-free allowances for basic energy consumption should be granted. The tax-free quantity should be differentiated according to the product and production technology. If the rates are set at the pareto-optimal level, an efficient allocation can be achieved without any tax revenue. If the objective is to raise revenue at the same time as reducing emissions, but avoiding a relocation of energy-intensive activities, the opposite "tax-ceiling" pattern should apply. Unfortunately, a precise differentiation of tax rates and of allowances will be difficult for practical reasons and questionable for legal reasons.

4 The case of Germany

There is no single best-practice design for tax allowances within the context of an energy tax. In selecting concrete models, it is necessary to weigh the partly conflicting demands against each other: Reducing the adjustment pressure for energy-intensive sectors, ecological effectiveness, economic efficiency, compatibility with market principles, and issues of administrative feasibility. Such weights cannot be derived from scientific principles but must be determined politically taking into account political priorities and specific national circumstances. For example, in a large economy with numerous energy-intensive companies like Germany, discretionary policies are more difficult to implement than in smaller economies with little industry (e.g. Denmark).

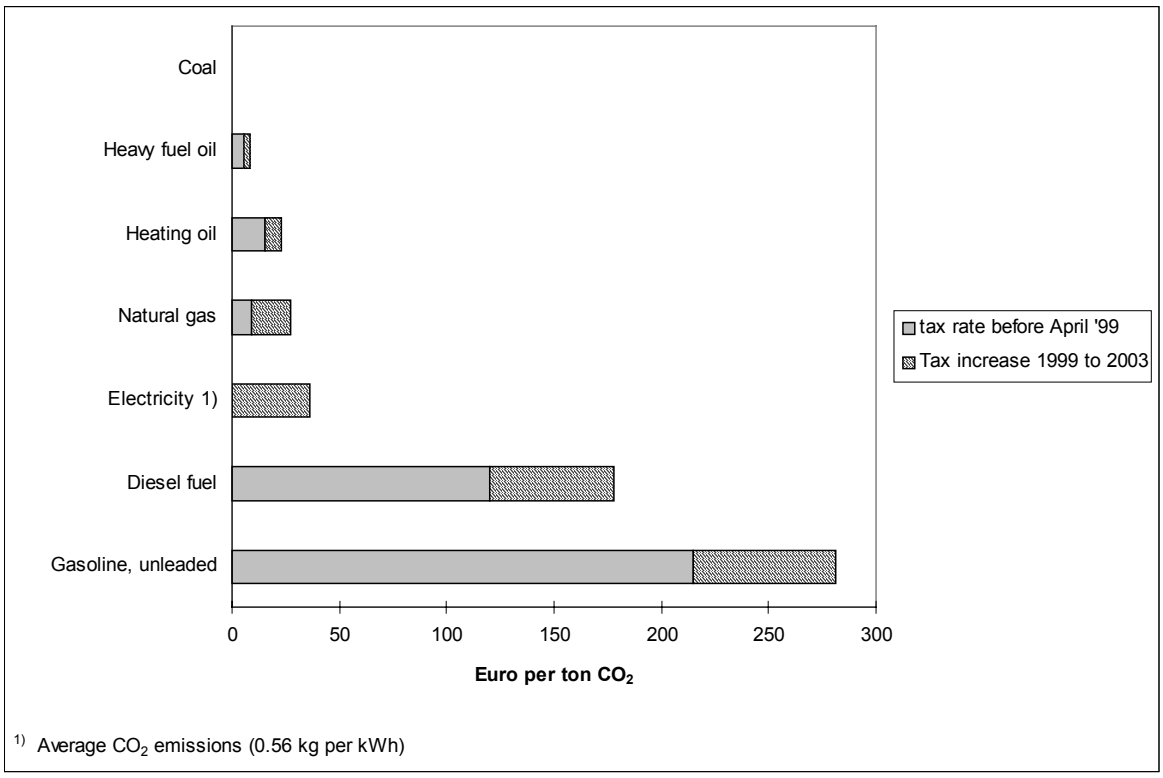
The German government therefore established a broad and rules-based system. There is no need nor discretion to judge the competitive situation of individual enterprises or economic sectors. Several deviations from a uniform taxation were established which can be considered as special provisions. Thus, effective tax rates have been differentiated by energy carriers, uses or users of energy. Figure 2 shows the tax rates in Euro per ton CO_2 by energy carriers.[9] It reveals substantial differences in the tax rates between energy carriers. Especially coals and heavy fuel oil display very low tax rates or are not taxed at all. This should be interpreted as a preferential treatment in favor of electricity generation and the iron and steel industry which have a share of more than 80% of the total use of coal in Germany on the one hand and coal mining on the other hand.

Moreover, enterprises of the goods and materials sector (i.e., manufacturing industry, energy/water, mining and construction sector) as well as agriculture, forestry and fishery have to pay reduced tax rates only. Mainly private households, retail and private road transport,

[9] To convert this to $ per ton of C multiply by roughly 0.3 ($/C = $/€ * €/$CO_2$ * CO_2/C = €/CO_2 * 1.10 * 12/44).

service companies, public institutions and small enterprises pay the full tax rate. Finally, enterprises in the manufacturing sector are eligible for tax rebates if the tax payment would otherwise exceed a certain threshold.

Figure 2: Energy taxes in Germany – Euro per ton of CO_2



This combination of special provisions can be seen as an attempt to balance the requirements of administrative practicability, market compatibility, equal treatment and an effective limitation of the net burden of energy-intensive activities. Excluding coal from taxation directly profits some energy-intensive activities. Reduced tax rates will accommodate the needs of most enterprises at little administrative costs. Tax rebates need to be processed individually, but for a much smaller number of enterprises.

The current system has been established as the result of a controversial debate about previous proposals. The first draft law for an ETR[10] that was discussed in Germany, proposed the following treatment of industry: For all enterprises of the goods and materials sector the rate of the eco-taxes would be reduced to 25% of the regular rates. Moreover, a list of sectors was to be drafted that were to be considered "energy-intensive" and exempted from the tax. This list should be based on the average energy intensity of production (defined as the share of

[10] Gesetzentwurf zur ökologischen Steuerreform vom 17.11.1998

energy costs in total production costs above 6.4%) of economic sectors based on a 4-digit statistical classification of economic sectors.

In a hearing of the committee of finance of the German Parliament, experts forwarded harsh criticism against this proposal[11]. The German Institute for Economic Research criticized that[12]

- statistical categories are not appropriate to distinguish between more and less energy-intensive production processes. Enterprises are classified in statistical categories on the basis of the shares of different production activities. Therefore, energy-intensities of firms in the same category may vary substantially, so that firms which are not burdened by the ETR profit from tax exemptions and vice versa.
- Identical activities may be treated in a different way, because they belong to different categories. This is economically inefficient and legally questionable.
- Exempted energy-intensive activities additionally profit from the reduction of pension insurance contributions and thus experience a reduction of total production costs from the ETR. This leads to perverse incentive effects increasing the energy intensity of the economy instead of reducing it. Moreover, this kind of subsidies would not be accepted by the European Commission under the regulations for state aid.
- Using the share of energy costs in total production costs as an indicator is not appropriate taking into account the differences in the tax rates by energy carriers. For example, a production process mainly using coal may be classified as energy-intensive but are hardly paying any energy taxes.

After this hearing, the government revised the draft law and proposed the following approach which came into force in April 1999: All companies of the goods and materials sector (i.e., manufacturing industry, energy/water, mining and construction sector) as well as agriculture, forestry and fishery have to pay reduced eco-tax rates of 20% of the regular rates (except for motor fuels). Moreover, the most energy-intensive companies of the manufacturing sector received compensation for all tax payments which exceeded the reduction of pension contributions by more than 20%.

This approach avoided some but not all of the criticisms mentioned above:

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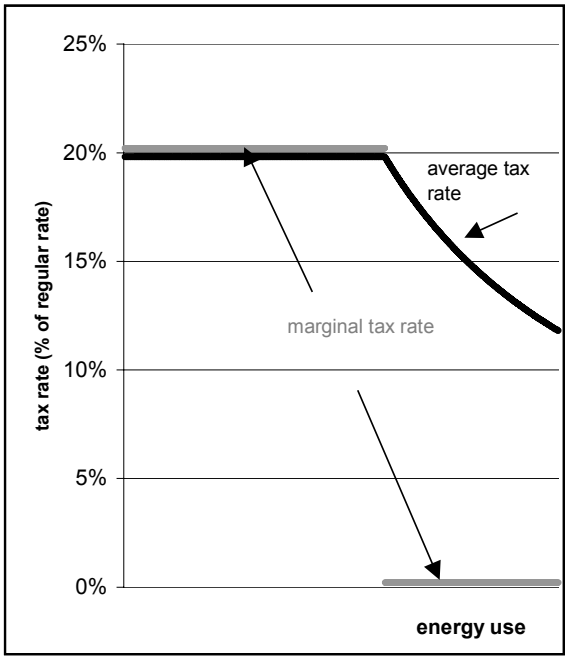
[11] Cf. BT-Drucksache 14/440 of 01 March 1999, http://dip.bundestag.de/btd/14/004/1400440.

[12] Cf. DIW (1999)

- Tax rebates depend on a specific firm's data and not on statistical categories.
- All enterprises of the manufacturing sector are treated in the same way, regardless of their sectoral classification. However, companies which do not belong to the manufacturing sector are not eligible for tax rebates. Therefore, similar activities may be treated in different ways according to their statistical classification.[13]
- Tax rebates are curtailed in such a way that the beneficiaries still have to bear a net burden even taking into account the reduction of social security contributions.
- Tax payments rather than energy-intensity is used as an indicator for the burden of the energy taxes.

Nevertheless, the treatment of energy-intensive processes still met a lot of criticism. In particular the low incentive effect for the beneficiaries of reduced tax rates and especially for those eligible to tax rebates has been disapproved. Figure 3 confirms this criticism: The "tax-ceiling" pattern combines high average tax rates with low marginal rates for firms which are eligible for tax rebates. Since the average rate decreases while energy-intensity increases, this pattern has been denounced as "absolution" for the worst polluters in the public and by political opponents.

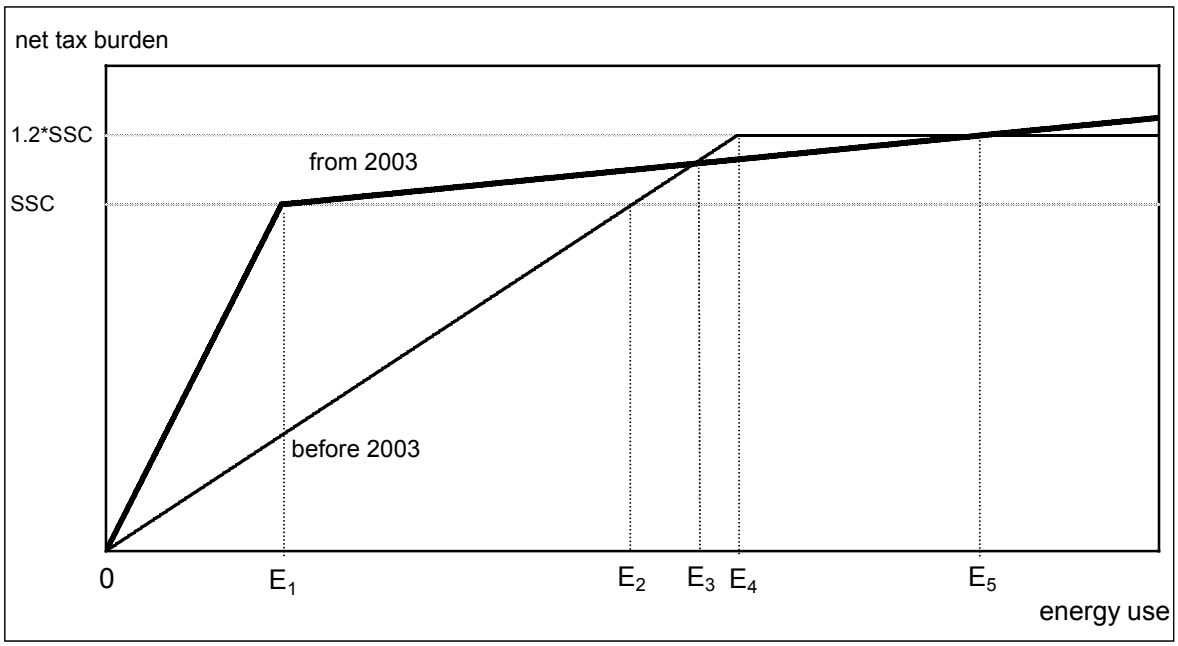
Figure 3: Marginal and average tax rate in Germany



[13] For this reason, several cases are pending with the Constitutional Court in Germany.

With the beginning of 2003, this system has been revised: the reduced rates now amount to 60% rather than 20%, increasing the incentive to improve energy-efficiency. Moreover, only 95% of the tax payments exceeding the (simple) savings of pension contributions will be refunded. With these changes, the German government intended to spread the burden of the eco-taxes more evenly and improve their ecological effectiveness. It expressed the opinion that four years after the introduction of the ETR, the incentive to use energy more efficiently could be increased without impairing the international competitiveness of energy-intensive industries. It is not clear at all, however, if the described changes achieve these targets. Figure 4 shows the tax schedules of an (arbitrary) enterprise for different quantities of energy consumption before and after the revision.

Figure 4: Net tax burden before and after 2003



The level of the curves in Figure 4 represents the tax burden (net of tax rebates), the slopes represent the marginal tax burden, i.e. the tax increase associated with a higher energy consumption. The steeper the curve the higher the incentive to economize on energy consumption. The overall tax burden is higher in the new tax schedule in all segments except between E_3 and E_5. The slope is steeper between 0 and E_1 (60% as compared to 20%) as well as above E_4 (5% as compared to 0%). Between E_1 and E_4 the incentive to economize on energy is lower than previously.

The net effect is ambiguous. Data about the number of companies in the different segments, their energy use and their sensitivity to price changes would be necessary to estimate the net

effect. None of these data were available when the new law was passed in December 2002. Therefore, presumptions have been voiced that the changes were motivated by the need to raise extra tax revenue.

5 Perspectives for future reforms

The current design of the ETR reflects conflicting targets. On the one hand, the government wants to induce emission reductions and raise revenue. On the other hand, it wants to protect energy-intensive sectors and prevent relocation. The approach taken by the German government is to differentiate tax rates and to make special provisions so that private households and small business, which are unlikely to relocate, have to pay high rates whereas energy-intensive sectors profit from a lower tax burden.

There are two basic problems with this approach. Firstly, it may be justified in the short run by the adjustment costs that would otherwise occur, but is inefficient in the long run. Even energy-intensive sectors have a substantial potential for energy-saving measures, especially if technological innovation is taken into account. If those branches expect to profit from special provisions in the long run, the adjustment process will not be set off and the government will face a similar situation in the future. Moreover, if taxes are set arbitrarily and under pressure from political groups, eco-taxes will not display the qualities of a market-based policy instrument that gives an economic incentive and serves as a filter to undertake energy-saving measures at the least cost. Secondly, it tries to achieve several partially conflicting targets with just one instrument. However, Tinbergen's law tells us that we generally need as many policy instruments as there are objectives.

1. The following scheme could help to overcome the dilemma between the short-term and long-term objectives. It proposes to combine two components of environmental taxes: A *long-term component* which gives a uniform incentive to avoid emissions by taxing every unit of emissions by the same tax rate for all uses and users of energy. In order to avoid that energy-intensive sectors have to bear too high a burden, the tax rates should be very low, but then gradually increased over the longer term. The tax level must be so low that the speed of structural change does not exceed politically acceptable levels. This component will induce neither substantial emission reductions nor a sizable tax revenue in the short term. It will, however, provide an incentive to undertake long-term adjustment measures especially in sectors with long capital cycles. For this to happen, no exemptions or special provisions are allowed and the tax path has to be specified over the long term.

Additionally, a *short-term component* could be introduced which induces emission reductions in the short term and raises revenue. This component would be targeted primarily at those users of energy where less economic or social problems are to be expected. The larger the long-term component grows, the less important will be the short-term component. In the very long run, the short-term, discretionary component should vanish and environmental policy should be predominantly market-based.

2. In order to overcome the problem posed by Tinbergen's law, additional instruments need to be taken into consideration. If politicians disregard this problem, they tend to over-burden a single instrument and have to make unsatisfactory compromises. There is a host of instruments which can be used to induce reductions of emissions (e.g. energy audits), to make Germany more attractive for investments (e.g. a general tax reform or dismantling of red tape policies), to spur innovation and foster other policy objectives. Other countries have gone this way, e.g. by replacing the incentive effect of environmental taxes for energy-intensive activities by energy audits.

Any further development of environmental taxes and special provisions in Germany will have to take into account changes of the regulatory framework in the European Union. Especially the interplay between the emissions trading system for parts of the European industry which is planned to come into force in 2005 might change the role of energy taxes in climate policy.

One prerequisite for such an integrated approach is a clear statement of the policy targets that are to be pursued by a given set of instruments. Unfortunately, the political language is not very clear in this respect. For this reason, it is not possible to tell if the special provisions which are applied in Germany are pertinent to the policy targets or which combination of instruments would be more appropriate.

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